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(54) A workpiece pick-up device

(57) A pick-up device (1) for removing and relocating workpieces from a stack (4) is provided with at least two pick-up rollers (14, 15) for guiding adhesive pick-up tape (13) advanced from a supply hub (11) to a take-up hub (12). After each actuation of the pick-up rollers (14, 15), the pick-up tape (13) is incrementally advanced so that a different adhesive surface is presented by the pick-up rollers (14, 15) each time they are moved to engage and remove a workpiece. Additionally, when the pick-up tape (13) is completely taken up by the take-up hub (12), the device (1) is selectively reversible so as to cause the tape (13) to be incrementally withdrawn from the take-up hub (12) and returned to the supply hub (11) so as to improve the life expectancy of the adhesive pick-up tape (13).

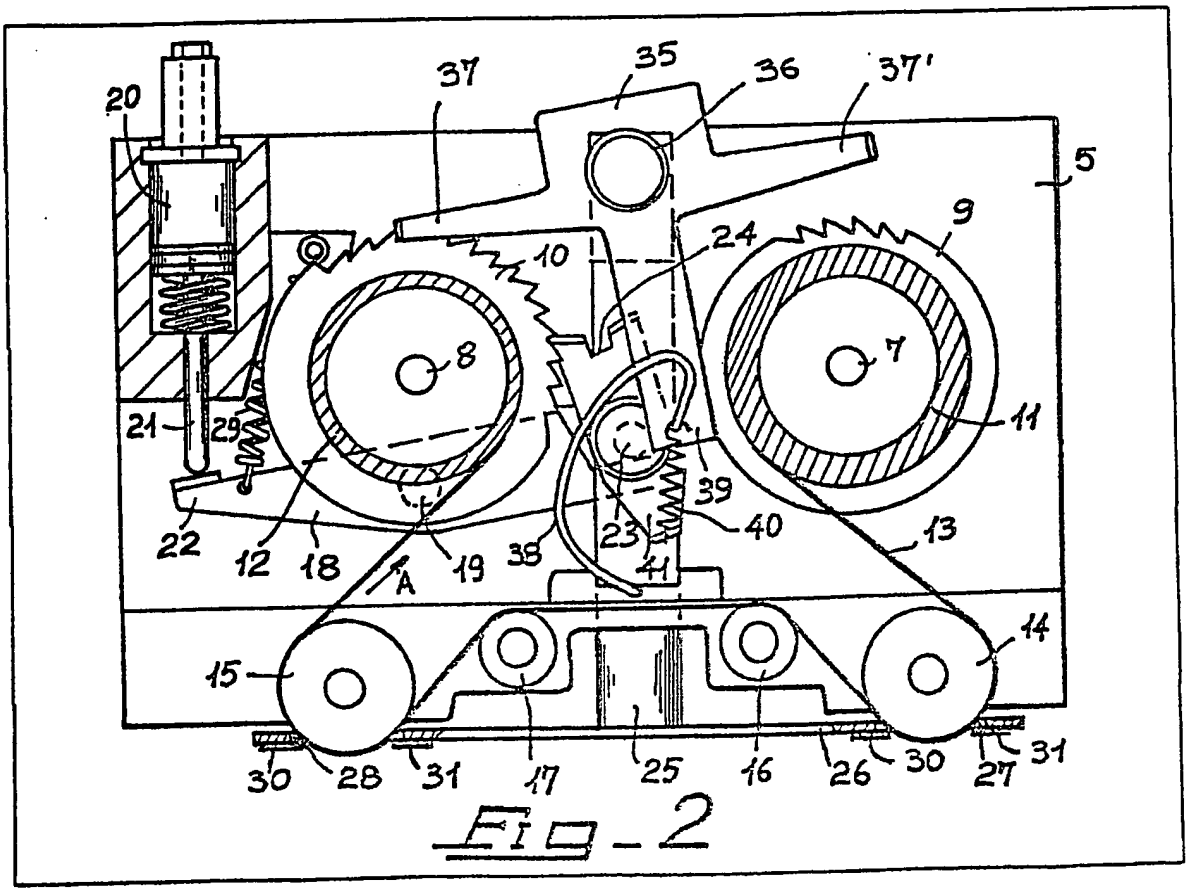

Fig. 2

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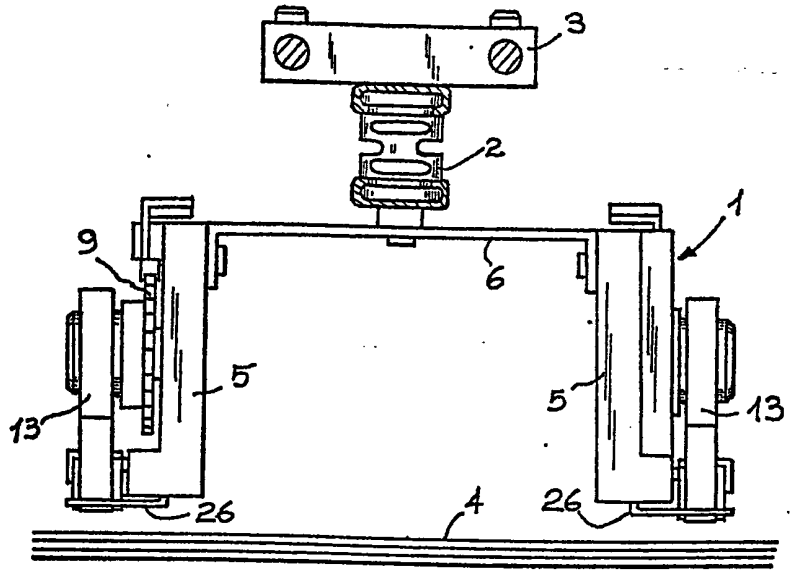
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Fig_1

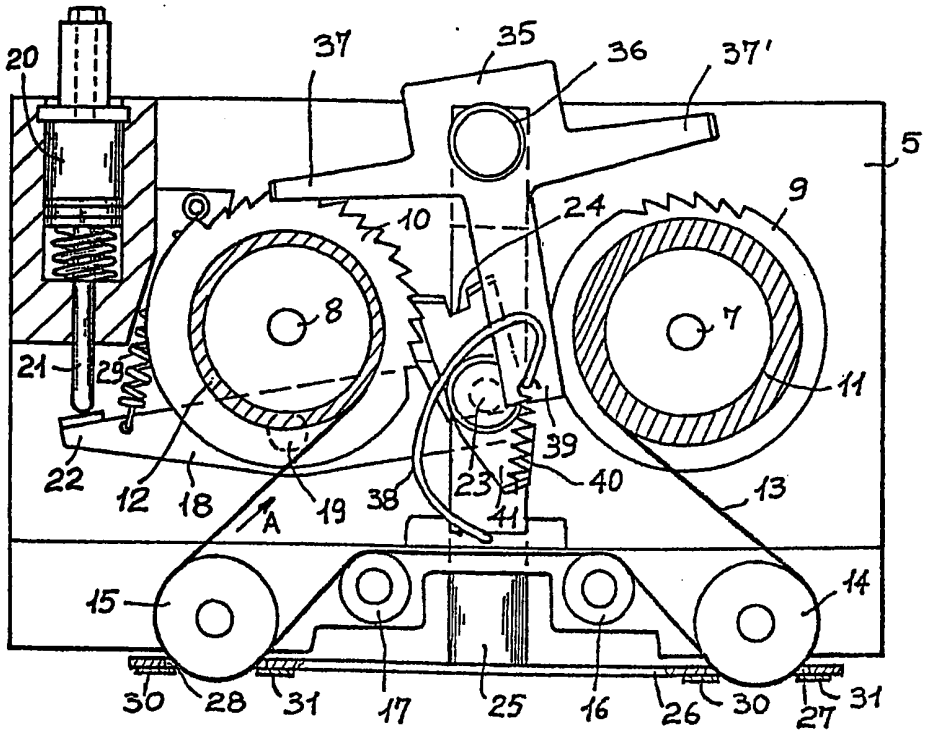
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Fig_2

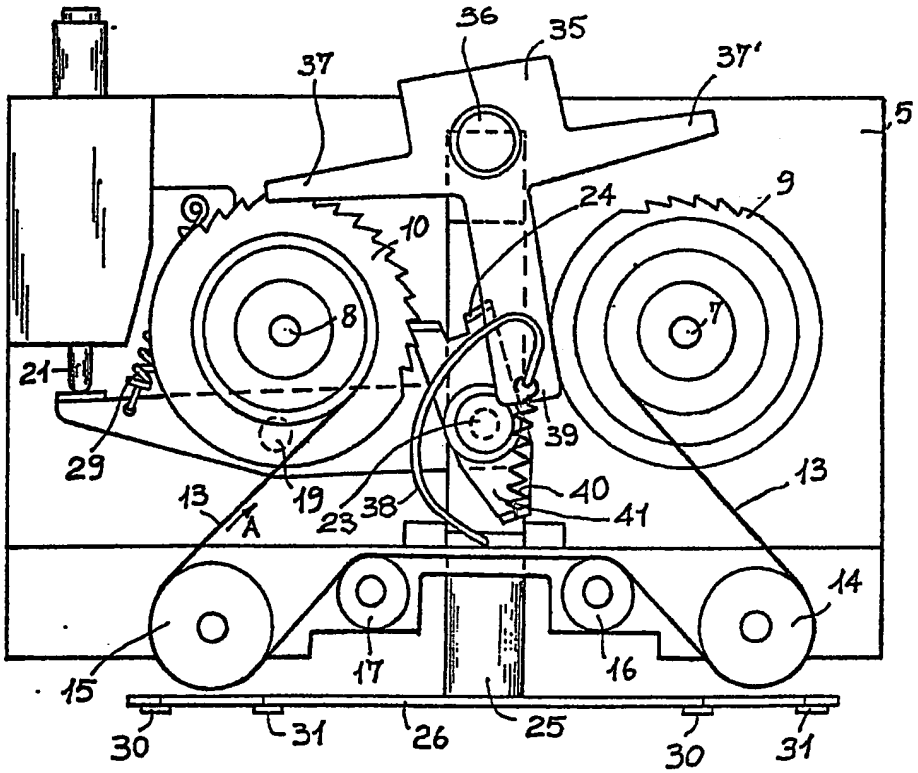

Fig_3

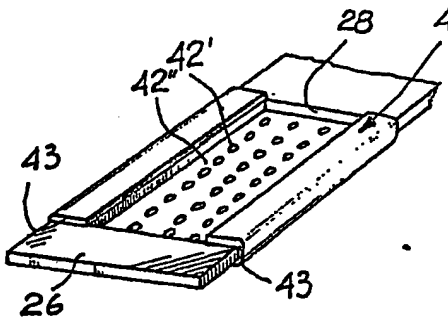

Fig_5

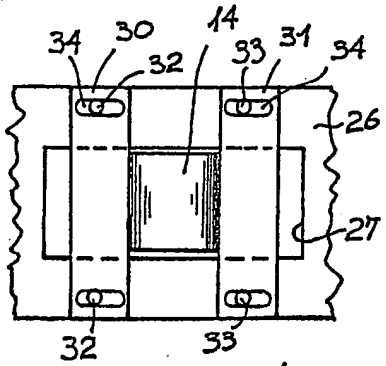

Fig_4

SPECIFICATION

A workpiece pick-up device

The present invention relates to a workpiece pick-up for a materials-handling machine such as may be used for removing workpieces from a stack by means of adhesive pick-up tape operatively associated with pick-up rollers of the device.

Devices for removing workpieces from a stack and then relocating them by adhesive or pin type pick-up units are well known; however, such known devices possess limitations which do not permit them to accommodate a wide variety of different types of workpieces, For example, in the case of exceptionally thin wokpieces, the pin type pick-up units can easily tear and damage the workpiece and also penetrate more than a single workpiece so that their separate and individual removal from a stock cannot be controlled. With known adhesive type pick-up units, difficulty is experienced in detaching certain types of workpieces from the unit and relocating them as desired. Additionally, with the latter type of known pick-up units, the short operating life of the ahesive pick-up tape is considered an undesirable feature necessitating frequent replacement of the tape.

According to the present invention, there is now provided a workpiece pick-up device for a materials-handling machine and comprising a cross-member provided with a pair of spaced support brackets depending therefrom, a pair of spaced pick-up rollers mounted on each support bracket, means rotatably mounted on the support brackets for supporting and extending a source of adhesive pick-up tape into operative association with the pick-up rollers, actuating means connected to the support brackets for effecting engagement with and pick-up of an uppermost workpiece by the pick-up rollers on movement of the pick-up member to a stack of such workpieces, means operatively connected to the actuating means for so rotating the suppoing and extending means as to present a different tape surface associated with the pick-up rollers with each movement of the pick-up member, and means operatively associated with the actuating for releasing a workpiece from the pick-up rollers after its removal from the stack.

Embodiments of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a front view of a workpiece pick-up device embodying the present invention,

Figure 2 is a view in side elevation showing pick-up rollers of the device in position for removing a workpiece from a stack,

Figure 3 is a view similar to Fig. 2, but showing the pick-up rollers in a position for releasing a workpiece from contact therewith,

Figure 4 is a bottom view of a portion of the pick-up member showing the location of one of the pick-up rollers and

Figure 5 is a perspective view of a modification for removing a workpiece from a stack.

Referring now to the drawings, Fig. 1 shows a workpiece pick-up device which is identified generally by numeral 1, hereinafter referred to as pick-up member and attached to the lower end of a damper element 2. This damper element 2 is of a suitable elastomeric material and serves to provide the device with a self-aligning feature. The upper end of the damper element 2 is connected to a bar 3, which is actuated by a drive means (not shown) so as to cause lowering, raising and rotary lateral displacement of the pick-up member while performing its intended function of engaging, removing and relocating workpieces from a stack 4 in Fig. 1. The pick-up member 1 comprises a pair of spaced support brackets 5 depending from opposite ends of a cross-member 6 which serves to attach the pick-up member to the lower end of the damper element 2. Each support bracket 5 is provided with a pair of spaced pivot pins 7 and 8, which rotatably support ratchet wheels 9 and 10 respectively. The ratchet wheels 9 and 10 are provided with hubs 11 and 12, respectively, and hub 11 carries a roll of adhesive tape 13 wound thereon. As shown in Figs. 2 and 3, the adhesive tape 13 extends from its source about a substantial portion of a pair of pick-up rollers 14 and 15 as well as being in operative engagement with a pair of tensioning rollers 16 and 17 and the extended end of the tape 13 is attached to the hub 12.

In Figs. 2 and 3, the support brackets 5 are shown provided with levers 18 mounted intermediate their ends on pivot pine 19. A pneumatic cylinder 20 is operatively connected by its actuating rod 21 to the lever 18 at its end 22. The oppoite end of lever 18 carries a pivot pin 23, which pivotably supports a pawl member 24 and is operatively connected to a vertically disposed shaft 25. The lower end of shaft 25 is fixed to a horizontally disposed plate member 26 and is raised and lowered as required by the pivoting movement of lever 18. The raising and lowering of the shaft 25 also causes the pawl members 24 to move upwardly and downwardly. During its upward movement, the pawl member 24 causes the ratchet wheel 10 to be rotated on the pin 8 through a distance corresponding to one tooth of the ratchet wheel and in a counter-clockwise direction as viewed in Figs. 1 and 2.

The plate member 26 is provided with a pair of spaced openings 27 and 28 which are in vertical alignment with the pick-up rollers 14 and 15, respectively. Raising of the plate member with the shaft 25 causes the pick-up rollers 14 and 15 to partially penetrate and

project below the openings 27 and 28. Each incremental rotation of the ratchet wheel 10 corresponds to the unwinding of adhesive tape 13 from the hub 11 and onto the hub 12. Thus, the portions of the adhesive tape 13, which are located in the positions corresponding to the portions of the pick-up rollers 14 and 15 projecting below openings 27 and 28, form the pick-up means for the uppermost workpiece of the stack 4 when the pick-up member 1 is lowered onto the stack. After engaging the uppermost workpiece, the pick-up member is raised with the workpiece and, to relocate the latter in a predetermined location, the actuating rod 21 is released, as shown in Fig. 3, to permit a spring 29 to pivot lever 18 in a clockwise direction as viewed in this figure of drawing. Movement of the lever 18 in this direction causes its end 22 to move upwardly and the opposite end with pivot pin 23 to move downwardly. The downward movement of pivot pin 23 lowers the pawl members 24 so that it engages the next tooth of the ratchet wheel 10 and also lowers the plate member 26, fixed on shaft 25, to a position spaced from the lower portion of the pick-up rollers 14 and 15. The workpiece, which is attached to the adhesive tape 13 in operative association with the pick-up rollers 14 and 15, is automatically detached from the tape as the plate member is moved to a position below the pick-up rollers.

As shown in Figs. 2, 3 and 4, the underside of the plate member 26 is provided with two pairs of transverse members 30 and 31, which are attached by screws 32 and 33, respectively, in operative association with the openings 27 and 28, respectively. These transverse members 30 and 31 traverse their respective openings (Fig. 4), their assembly screws 32 and 33 extending through elongate holes 34 in the transverse members, and serve as a means for controlling the size of the openings 27 and 28, through which the pick-up rollers 14 and 15 are adapted to protrude. Additionally, in order to vary the distance between the centres of the openings 27 and 28, the position of the cross-members 30 and 31 are adjusted in such a manner that the positions of the pick-up rollers 14 and 15 are regulated in a corresponding manner and in such a way that the axes of the openings 27 and 28 pass through the axes of the pick-up rollers 14 and 15. These two adjustments of the width of the openings 27 and 28 and of the distance between their centres serves the purposes of causing the pick-up rollers 14 and 15 to project a greater or lesser amount and of drawing them closer together or moving them further apart as desired so as to adequately accommodate the nature and dimensions of the workpieces to be removed.

As shown in Figs. 2 and 3, the pick-up device comprises a brake element 35 pivotably supported at 36 on the support bracket 5. This brake element 35 is provided with an arm 37 having a free end located between two adjacent teeth of the ratchet wheel 10 and serves to prevent rotation of the latter in a direction opposite to that in which it is incrementally rotated by the pawl member 24.

The brake element 35 is continually urged into engagement with the ratchet wheel 10 by means of a generally C-shaped spring 38. One end of the spring 38 is attached to an arm 39 of the brake element 35 and the opposite end is fixed to a stationary member attached to the support bracket 5. A coil spring 40 is attached by one end to the arm 39 and by its opposite end to the pawl member 24 at the end 41 thereof and serves to continually urge the pawl member into meshing relation with the teeth of the ratchet wheel 10.

Each actuation through the pneumatic cylinder 20 of its actuating rod 21 against the end 22 of the lever 18 causes the pawl member 24 to rotate the ratchet wheel 10 a short distance in counter-clockwise direction, as viewed in Figs. 2 and 3, and the adhesive tapes 13 to advance in the direction of the indicating arrow A. As the adhesive tape 13 is caused to advance in the direction of arrow A, it is also moving across the surface of the pick-up rollers 14 and 15 so that a different adhesive pick-up surface is caused to engage the stack 4 each time the pick-up member 1 is lowered to engage and remove the uppermost workpiece therefrom.

When all of the adhesive tape 13 has been withdrawn from hub 11 and transferred onto hub 12, the position of the brake element 35 is reversed so that the free end of its arm 37' is positioned between the teeth of the ratchet wheel 9. The arm 37' is continually urged in this direction by the C-shaped spring 38 and the coil spring 40, being displaced to the left of pivot pin 23, continually urges the pawl member 24 in a direction to mesh with the teeth of the ratchet wheel 9. In this position, the pawl member 24 is also actuated by the lever 18 being pivoted by the actuating rod 21 of the pneumatic cylinder 20 and incrementally advances the ratchet wheel 9 in a clockwise direction as viewed in Figs. 2 and 3. Rotation of the ratchet wheel 9 in this direction causes the adhesive tape 13 to move in the opposite dirrection of arrow A until all of the tape has been rewound onto the hub 11.

Control of the adhesive tape 13 in this manner permits alternative forward and reverse winding onto and from hubs 11 and 12 until replacement of the tape is required as a result of wear when it loses its adhesive qualities so that workpieces will no longer adhere thereto.

The advance of the adhesive tape 13 in the direction of arrow A by incremental rotation of the ratchet wheel 10 occurs in equal steps;

however, there is a different rate of advance of the tape when it is moving in the opposite direction when ratchet wheel 9 is being driven to rewind the tape onto hub 11.

The reason for a difference in the rate of advance between the two directions of movement of the tape is caused by the two different positions which the pawl member 24 must assume relative to lever 18 when engaged with one or the other of the ratchet wheels 9 and 10. This difference in the rate of advance is considered advantagous, because regardless of which direction the adhesive tape 13 is travelling, each actuation of the pick-up member 1 causes a different adhesive tape surface to come into operative association with the pick-up rollers 14 and 15. This manner of continually presenting a different adhesive pick-up surface permits a considerable number of alternate windings and unwindings of the tape to and from hubs 11 and 12.

The release of certain lightweight workpieces that are relatively easy to pick up, may be difficult, for when the plate member 26 is lowered, the workpiece might simply pass into the openings 27 and 28 and remain in contact with the adhesive tape 13. To prevent a condition of this nature, the openings 27 and 28 are provided with grid inserts or a thin perforated sheet insert 42 in Fig. 5. This perforated sheet 42 is provided with a pair of spaced guides 43, which serve to position the perforated sheets within the openings 27 and 28, as shown in Fig. 5. The perforated sheets 42 cause a workpiece to adhere to the adhesive tape 13 only through holes 42' at positions corresponding to the projecting portions of the pick-up rollers 14 and 15. This manner of removing a workpiece from a stack provides a positive workpiece detaching means, for when the plate member 26 is lowered to a position below the pick-up rollers 14 and 15, the solid areas 42''of the perforated sheet 42 causes the workpiece to be peeled off from contact with the adhesive tape 13. The perforated sheets 42 can be quickly and easily inserted into or removed from the plate member 26 so as to enable different types of workpiece to be accommodated.

CLAIMS

1. A workpiece pick-up device for a materials-handling machine and comprising a cross-member provided with a pair of spaced support brackets depending therefrom, a pair of spaced pick-up rollers mounted on each support bracket, means rotatably mounted on the support brackets for supporting and extending a source of adhesive pick-up tape into operative association with pick-up rollers, actuating means connected to the support brackets for effecting engagement with and pick-up of an uppermost workpiece by the pick-up rollers on movement of the pick-up member to a stack of such workpieces, means operatively connected to the actuating means for so rotating the supporting and extending means as to present a different tape surface associated with the pick-up rollers with each movement of the pick-up member, and means operatively associated with the actuating means for releasing a workpiece from the pick-up rollers after its removal from the stack.

2. A device as claimed in claim 1, comprising braking means for preventing reverse movement of the supporting and extending means after being actuated by the rotating means.

3. A device as claimed in claim 1, the supporting and extending means comprising a first hub for supporting a roll of adhesive pick-up tape and releasing the same therefrom into operative engagement with the pick-up rollers, and a second hub for receiving tape from the pick-up rollers.

4. A device as claimed in claim 1, the actuating means comprising a vertically disposed shaft member mounted for reciprocating movement on each of the support brackets, and a plate member mounted on the lower end of the shaft member and provided with openings vertically aligned with the pick-up rollers for projection of the latter therethrough on upward movement of the plate member with the shaft member.

5. A device as claimed in claim 4, wherein the openings are provided by perforated insert sheets for reducing the area of contact by the adhesive tape with a workpiece when the plate member is raised to place the pick-up rollers in operative association with the openings.

6. A device as claimed in claim 4, the actuating means further comprising a pivot pin mounted intermediate the ends of the shaft member, a lever pivotably mounted on the support bracket with one end operatively connected to the pivot pin, and a pneumatic cylinder operatively connected to the opposite end of the lever for raising the shaft member and plate member.

7. A device as claimed in claim 4, the releasing means comprising a spring connected between the support bracket and the lever for lowering the shaft and the plate member to a position below the pick-up rollers.

8. A device as claimed in claim 3, the rotating means comprising a ratchet wheel operatively connected to each of the hubs and a pawl member pivotably mounted on the pivot pin for selective engagement with one of the ratchet wheels.

9. A device as claimed in claim 4, wherein the plate member comprises a tranverse member operatively associated with the openings for selectively varying the width thereof.

10. A workpiece pick-up device substantially as hereinbefore described with reference

to and as illustrated by the accompanying drawings.

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